Communities and Local Government

CFRA
CHIEF FIRE & RESCUE ADVISER

Fire and Rescue Service Operational Guidance

GRAs
generic risk assessments

GRA 2.1
Rescues from confined spaces
2.1.3 trenches/pits

Generic Risk Assessment 2.1

Rescues from confined spaces

2.1.3 trenches/pits

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The Generic Risk Assessments in this series only apply to England.

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SECTION 1

GRA 2.1 Rescues from confined spaces 2.1.3 trenches/pits

Scope

GRA 2.1 consists of four intrinsic sub-parts that deal with specific activities of rescues from confined spaces :

2.1.1 sewers

2.1.2 silos

2.1.3 trenches/pits

2.1.4 collapsed structures

Although trenches/pits are confined spaces this GRA examines only those hazards, risks and controls that are specific to FRS activities at incidents involving rescues from Trenches and Pits.

It must be read in the context of GRA 2.1 Confined Spaces and The Confined Spaces Regulations 1997, which provides information relating to FRS work in confined spaces.

As with all GRAs this provides a starting point for Fire and Rescue Services (FRS) to conduct their own assessments, produce their own Standard Operating Procedures (SOPs) and written Safe Systems of Work (SSoW) within the context of local conditions and existing organisational arrangements.

Significant hazards and risks

Trenches occur as part of activities in building works and utilities maintenance, pits occur in a variety of locations, such as agricultural and industrial sites.

Risk varies with the depth of the trench or pit and ground conditions surrounding the area. The entry of water, other fluids or gases creates additional hazards for operational personnel.

Typical accidents involving workers being:

- trapped or buried below ground level

- crushed by movement of soil, equipment, machinery/plant
- falling into open trench or pit
- drowning.

Trench or pit collapse can result from:

- excessive rainfall effecting the stability of the terrain
- vibration from nearby heavy plant
- insufficient piling and bracing of the trench sides
- heavy plant positioned to close to trench/pit.

An incident may require the removal of a quantity of soil, or in some cases the removal of machinery or plant to access trapped persons. There may be a need for metal piling, timber shoring, props, corrugated iron (trench) sheets and ladders.

Typical hazards and their associated risks include:

Unstable ground

There is a serious risk of injury to anyone entering an unsupported or inadequately supported excavation when you bear in mind that a cubic metre of soil can weigh 1.25 tonnes. Even a small collapse is capable of inflicting serious or fatal injury, even if the casualty is not completely buried.

When excavations are carried out, ground conditions can vary widely, even over relatively short distances. Soil cannot be relied upon to support its own weight for any length of time. The apparent stability of vertical faces in clay or silty sands can deteriorate rapidly and collapse suddenly, without warning. Any unsupported face in excavations could collapse, unless it is adequately supported or sloped (Battered) back at a safe angle.

The stability of an excavated face is influenced by factors such as:

- type(s) of soil
- height and angle of face
- loading at ground level adjacent to the face e.g. soil heaps, vehicles, people
- presence of ground water or surface water (wet soil may become more fluid)
- presence of buried services behind the face of the excavation
- presence of other buried obstructions beyond the face, such as manholes, foundations and tree roots
- presence of natural discontinuities in the soil behind the face, such as sand pockets, changes in strata and geological features
- presence of previously disturbed ground near to the trench, such as reinstated trench or foundation excavation
- weather conditions

- length of time the excavation has been open.

The movement of heavy vehicles or plant and activities such as piling or demolition in the vicinity will cause vibration and shock waves that may undermine unstable ground.

Inappropriate and/or insufficient resources to provide safe systems of work for the FRS task

There is a societal expectation that a firefighting team will arrive and achieve something. Evidence from accident investigations has shown that firefighters will attempt tasks regardless of the resources available to them risking death or serious injury.

Working at height

Trenches and pits vary in depth and size and may give little sign at surface level of the size or depth of the opening. Shallow trenches are defined as up to 1.5 metres in depth, medium trenches are between 1.5 to 6 metres and deep trenches have depths over 6 metres.

Personnel risk falling into the opening of a pit or trench, equipment may fall onto personnel or a casualty while they are in the trench or pit causing serious or fatal injuries.

Further information on safe working at heights is contained in GRA 5.10

Restricted working area

Trenches and pits, by their nature, offer hazardous working areas. Internal conditions will be further restricted by the presence of equipment, services, struts, boarding and debris, much of which may be dislodged or moved during incidents. The movement of personnel entering the opening may be restricted and there is a potential for injuries, resulting from slips, trips, falls and collisions with obstructions within the opening.

Presence of utilities

Underground services may be exposed or damaged during trench excavations creating an additional hazard to personnel.

When digging out soil following a landslip there is a risk of inadvertently hitting and damaging the utility (a strike) causing it to discharge its contents, eg. high voltage-explosive electrical discharge, release of gas, water, sewage.

Personnel entering the opening may come into contact with live electrical services or escapes from pressurised pipe systems. In the case of fluids they may dissolve/liquefy the soil further undermining the excavation. As water conducts electricity a wet/waterlogged trench may become live in an electrical strike.

Hazardous materials

Any trench or pit may collect flammable or toxic vapours e.g. methane, petrol/diesel fuel vapour and at industrial sites a heavier than air gas or vapour may be present.

The risk of asphyxiation, poisoning or toxic inhalation may occur to any person entering the trench or pit. Additionally the opening may contain a flammable or explosive mixture in the atmosphere.

There is a risk of biological contamination/infection to FRS staff from:

- water – borne pathogens e.g leptospirosis
- contaminated soil; or
- body fluids from casualties.

Gasses trapped underground e.g. products produced by the decomposition of buried rubbish such as methane and hydrogen sulphide and those emitted by old gas works waste (hydrogen cyanide) can be released by excavations.

Ingress of water and mud

Water may enter below ground features and, dependant on the type of soil, accumulate in the trench or pit. Surface water run-off or ground water seepage can create large quantities of water in the opening. Weather or climatic conditions can create a high concentration of water in the soil, altering the composition and causing the soil to act as a fluid.

Personnel can become snagged on entering deep water or mudflows within trenches and pits as water in the opening may be of an unknown depth and may conceal obstructions.

Oxygen deficient atmosphere

Natural ventilation may not be adequate to allow a through flow of air. Deep trenches and pits may therefore have an oxygen deficient atmosphere.

The operation of equipment, such as internal combustion engines, in or near the opening may not only use up oxygen from the air but also produce exhaust gases, such as carbon monoxide, which can lie and accumulate in the opening.

Substances may be released/ disturbed inside the trench/pit that may displace the oxygen. For example, the action of acid rainwater on exposed chalk/limestone will produce carbon dioxide that can lie in excavations.

Difficult access and egress

Gaining access to the trench or pit may be difficult due to:

- building excavations
- machinery and plant and vehicles in the vicinity
- broken and uneven ground.

Entry and egress may also be difficult because of restriction of movement, depth of descent and any collapse of the face that has taken place. If the stability deteriorates rapid collapse can take place without warning. Rapid evacuation may be difficult.

Personnel are at risk from slips, trips, falls and collisions within the feature and if further collapse takes place, of entrapment and being unable to make egress quickly.

Exposure to weather conditions

Weather conditions can affect the stability of the soil and make working conditions difficult for personnel.

Working at incidents involving trenches or pits may be protracted with personnel exposed to the elements for a considerable amount of time. In wet conditions clothing and equipment will become wet and muddy and create heavy and slippery conditions underfoot.

The risk of slipping and falling, the slippage of tools and collisions is higher when personnel are exposed to adverse weather conditions.

Heavy physical work

Negotiating obstacles in dirty and slippery conditions will make positioning and use of equipment difficult. Heavy wet high clay soils bog the feet down and require extra care and effort to walk in. They present an increased risk of slipping/tiredness or becoming stuck.

Manual handling

Operational equipment will have to be positioned by the minimum number of personnel within the pit or trench, or at, surface level. Confined and restricted conditions make manual handling tasks difficult. The risk of musculoskeletal injury to personnel arises from:

- difficult access, egress and movement within the feature
- weight and size of casualty
- weight and size of equipment
- internal conditions i.e. dark, slippery, wet
- repeated manual handling tasks required
- movement of equipment and personnel within a confined space
- minimum numbers in the risk area to share the weight of the load.

Poor/low light levels

In deep trenches or pits poorly illuminated by natural light, personnel may experience difficulty due to the dark conditions. Risk of collisions, manual handling accidents, and slips trips and falls will be higher in a poorly illuminated working area.

Key control measures

Pre-planning

An essential element of management of risk is pre-planning. The Integrated Risk Management Plan (IRMP) will identify FRS standards in terms of equipment and the operational personnel required for SSoW to be employed.

FRSs should collate information on the risks in their area and make site specific risk information available to all relevant personnel prior to and upon arrival at incidents. This approach will help to ensure that work activity is planned, supervised and carried out safely.

There are two categories of trench/pit incidents that the FRS is called to attend:

- excavations that, due to their size, nature or location, Services are made aware of prior to the incident
- excavations that Services are not aware of prior to the incident.

Although the hazards in both instances are largely the same, trenches or pits that the FRS are aware of (i.e. large-scale mains replacements) provide opportunities for pre- planning and the production of plans. Memorandums of understanding should be established with local authorities regarding notification of planned works.

When carrying out inspections for pre-planning purposes liaison should be made between the FRS and the following:

- contractors/site health and safety officer
- local authority departments
- utilities companies
- local and regional Urban Search and Rescue Teams (USAR).

These contacts will be able to provide valuable information regarding

- soil characteristics
- extent of trenching or pit excavation i.e. depth and timing of excavations
- assessment of the specialised personnel, equipment, training, pre determined attendance (PDA) and mobilising procedures necessary
- the hazards present and current, existing SSoW.

FRSs should use appropriate SSoW, training, supervision, equipment and specialist personal protective equipment (PPE) to ensure the safe operational conclusion of these types of incidents.

FRSs should undertake debriefs as appropriate feeding any significant learning points back into the development of SSoW, training programmes and equipment procurement.

Pre-determined response

FRSs should ensure that the operational response to an incident will be sufficient to allow relevant SSoW to be implemented. A task analysis of the various scenarios at this type of incident will enable a FRS to plan an effective response. This together with any known site specific information will provide a risk based assessment of the pre-determined response.

As part of the pre-planning process the pre-determined response may also include the need for: specialist vehicles; specialist equipment, techniques and assistance from other agencies.

Training

Section 2 of the *Health and Safety at Work etc. Act 1974* lays down the general duties of employers to their employees.

Section 2 (2) (c) of the act requires employees to provide information, instruction, training and supervision as is necessary to ensure, so far as is reasonably practicable, the health and safety at work of his employees;

- All FRSs must ensure their personnel are adequately trained to deal with risk/ hazard associated with rescues from trenches and pits.
- The level and nature of training undertaken should be shaped by an informed assessment of operational and individual needs in line with the FRS guidance on the integrated personal development system; national occupational standards and any internal training plan.
- Training and development should follow the principles set out in national guidance documents. Training programmes should generally be structured so that they move from simple to more complex tasks and from lower to higher levels of risk.
- Training and development will typically cover standard operational procedures as well as ensuring knowledge and understanding of equipment and the associated skills that will be required to use it.
- Training programmes need to consider the need for appropriate levels of assessment and provide for continuous professional development, to ensure maintenance of skills and to update personnel whenever there are changes to procedure, equipment, etc.
- Training outcomes should be evaluated to ensure that the training provided is effective, current and is meeting defined operational needs as determined by the FRS Integrated risk management plan.

Specific training for trench and pit incidents must be undertaken to familiarise and train operational personnel for conditions which may be encountered at such sites, signs and symptoms of collapse and the typical plant, equipment and construction practices in trenching and excavations. The level of training provided should be appropriate to the role expected of personnel responding in accordance with the PDA.

In some locations the ambulance service provide the Hazardous Area Response Team (HART). This team is capable of supporting FRSs with casualty assessment and care in the hot zone of an incident. Where appropriate FRSs should make arrangements to train with these teams.

Training should practice establishing a SSoW including identification and removal or control of hazards to personnel prior to entering the trench and pit.

Safe system of work (SSoW)

No person shall enter a trench or pit (confined space) for any purpose where it is reasonably practical to achieve a task without entering.

Systems of work involving 'emergency actions' will need to acknowledge that work may need to commence before all hazards are eliminated. Not withstanding this consideration, a SSoW, including emergency procedures, must be in place for persons entering, working in and leaving a trench or pit, including the routine use of harnesses and lines.

Command and control

By their very nature, incidents involving trenches or pits tend to be very labour intensive, requiring high levels of command and control.

The Incident Commander (IC) should adhere to the principles of the current national incident command system. Prior to committing personnel to any hazard area IC must take into account all of the relevant factors before selecting the appropriate SSoW.

Prior to deployment of personnel within the hazard zone a thorough safety brief must be carried out.

The IC must choose the most appropriate SSoW based on pre-planning by their FRS and the pre-determined attendance for this type of incident. In doing so they shall take account of the:

- available on-site knowledge and expertise. On-site employees may be competent in excavation work, or have access to a competent person
- possibility of collapse of structures adjacent to the excavation such as walls at underpinning operations
- access to technical expertise e.g. a structural engineer
- availability of on-site plant, equipment or materials, drag boxes, proprietary trench support equipment or materials suitable for use as trench/pit supports
- possibility of improvisation of equipment, for example the use of ladders and air bags for shoring
- possibility of utilities being present (i.e. gas, water, electricity supply)
- need for atmospheric monitoring and ventilation of trench.
- possible need for intrinsically safe lighting

- need to establish appropriate RV points and marshalling areas.

When deciding on the most appropriate SSoW the IC needs to determine whether further assistance should be immediately requested e.g:

- aerial appliance (for access)
- specialist teams e.g. Technical Rescue, Rope Rescue
- more personnel to allow adequate crew rotation
- consider the use of USAR teams for their specialist knowledge and equipment
- medical professionals
- police.

Approach/cordon

As appliances and vehicles arrive at site the IC and drivers must be aware of pedestrians, moving vehicles, obstructions, broken ground and excavations. All vehicles must be kept well away from the trench or pit. Where practical, vehicles should remain on hard standing.

Consideration must be given to vehicle marshalling and a holding area/RV point at the earliest opportunity.

Personnel going on to the site must proceed with caution because of the possibility of excavations, trenches and pits not being readily visible and the presence of debris, equipment, plant and broken ground.

Personnel, equipment and materials (such as spoil heaps) must be kept at a distance of at least equal to the depth of the trench to avoid overloading the surface area near the trench or pit i.e. unstable ground which is liable to collapse.

This clear area must be maintained throughout the incident. Enhanced precautions and illumination will be a necessity at night. An inner cordon should be established (high-risk area) with a minimum exclusion zone of 3 metres where there is a fall potential.

Only essential personnel wearing appropriate personal protective equipment (PPE) must be allowed into the inner cordon area and their entry and exit controlled. Non-essential emergency service personnel must be moved outside the inner cordon.

Stabilising

The trench/pit must be stabilised utilising one or a combination of the following methods:

- use of expert advice to direct procedures
- battering (digging the sides back to improve the angle of slope of the face)
- use of proprietary support systems
- shoring up
- alternative use of Service equipment/ plant on site, by competent persons

- where possible, consider the use of suitable covering to protect crews and casualties from the elements of the weather.

Note:

Consideration may be given to spreading the load around the trench/excavation before any work commences by laying down sheets of wood (8x4 plywood) or similar around the trench/excavation.

Any trench support must reach to the top and bottom of the trench.

Personnel required to work within 3m of an unprotected trench or pit must have line restraint to control the risk of falls.

Pumps should be brought into use if the trench or pit is holding water. The pump should not be placed too close to the edge of the opening due to vibration, exhaust gases and weight. Consideration should be given to utilising non combustion pumps, electrical submersible, ejector etc.

The movement of heavy plant and vehicles nearby and activities in the vicinity that may cause shock waves in the ground such as demolition and piling must be stopped until the incident is concluded.

Access/egress

Entry into the trench or pit must be in an area where stabilisation measures have taken place (sides battered back or area protected by the support system). This should be suitably identified (consider a portable blue flashing light) and all crews briefed upon entering the inner cordon. Consider the use of a system to log personnel in and out.

Controlled access and egress must be maintained at all times due to the requirement for rapid evacuation from the feature. The IC may consider the use of an aerial appliance for access/egress assistance, having taken into account any vibration and loading that may or may not be posed by its position in relation to the location of the trench.

If items of debris, equipment or machinery are moved personnel must ensure that they are not placed in a position which may inhibit their rapid withdrawal and evacuation from the trench or pit.

Personnel entering trench/pit

The number of personnel entering the opening must be kept to the minimum required to safely conduct the rescue or render first aid. Access and egress must be controlled via an identified route. A record should be kept of personnel entering and leaving the hazard area.

If the trench/pit is considered to present the possibility of an irrespirable atmosphere breathing apparatus must be worn.

Gas testing and monitoring should be carried out by a competent person(s). They will establish the safety of the atmosphere using suitable equipment. The atmosphere should be monitored throughout the term of the incident to ensure it remains safe.

Personnel entering the trench or pit must be fully briefed on their task, evacuation procedures and hazards and controls. Personnel should wear a safety harness and line on approach to and when entering the trench. However, the line should be removed whilst in the trench to prevent entanglement with shoring equipment.

Relief crews should be arranged, however, their movements during change over around the edge of the trench must be strictly monitored to ensure the stability of the trench/pit is not further compromised.

Personal protective equipment (PPE)

A FRS must ensure that any PPE provided is fit for purpose and meets the required safety standards. When choosing suitable protective garments, the standard of clothing worn beneath the specialist PPE should also be taken into account. Consideration should also be given to the selection of suitable sizes of PPE.

PPE should also take account of the need for rescuers to be visible against the operational background including night working and for team leaders to be distinguishable within ICS.

All personnel must use appropriate levels of PPE including climatic (heat, cold, wet and inclement weather) and Respiratory Protection Equipment (RPE) where necessary.

Respirators are not generally considered suitable, as they offer no protection against oxygen deficiency and high concentrations of gasses and vapours.

Plant/buried services, pipe work

Personnel should be aware that their activities might uncover buried services and pipe work, which may alter the operational approach. Risk intelligence information must be gathered on the location of services within the incident area. Whenever possible detection equipment should be utilised to scan for utilities/services. The location, course and type of services must be clearly communicated to all personnel in the risk area and the IC.

All plant and services/utilities must be isolated and locked off where possible (keys removed). Unless there are critical systems/requirements e.g. hospitals.

Sharp tools such as picks and mechanical excavators should never be used in the vicinity of buried services, as their exact position is seldom known.

Safety Officers

Safety Officers should be appointed and fully briefed on signs of collapse (to the pit/trench and from that of possible nearby structures that may have been undermined), ingress of water and any observed changes, which may affect stability, or the safety of personnel in, or near a trench/pit.

Safety Officers will raise the alarm with the agreed evacuation signals; this signal must be recognisable from other ambient sounds. All personnel present, including works personnel and other emergency service personnel, must understand the evacuation signal and the actions to be taken when it is sounded.

Communications

Communications are essential to the safety of personnel and management of the incident.

A communication link must be established between: personnel working in the trench or pit, those at the surface, and with the IC. If flammable atmospheres are encountered or suspected then a means of intrinsically safe communication must be established.

Where possible, efforts should be made to ensure a line of sight is maintained with personnel working in the pit or trench.

Casualty handling

Any debris or soil should be cleared from the casualties' face and chest to enable them to breathe and for necessary first aid to be administered; resuscitation equipment should be taken into the trench/pit.

Consider ventilating the trench or pit and the use of breathing apparatus for casualties.

Careful selection of the appropriate tools to remove debris is needed.

Sharp tools such as picks and mechanical excavators should never be used in the vicinity of buried casualties or services as their exact position is seldom known.

When removing the casualty from the trench or pit manual handling should be planned and coordinated. Mechanical means and additional personnel should be considered. Where space is restrictive, individuals should make every effort to adopt good manual handling techniques.

Illumination/lighting

The area at the top of a trench or pit should be well lit before personnel are allowed to enter. This may be augmented with portable lighting or hand lamps.

Intrinsically safe lighting should be used, unless a competent person can determine it to be unnecessary by means of continuous testing with a suitable gas monitor.

Crew welfare

Working conditions for this type of rescue may be difficult and the nature of the tasks may be arduous, therefore the IC should make suitable arrangements for rotation or resting of crews and the early provision of relief crews.

Personal hygiene arrangements must be established (e.g. for washing hands) before undertaking the provision of refreshments.

In cold/inclement weather and at protracted incidents it may be necessary for additional welfare and food to be provided.

Decontamination

Arrangements should be made on site to allow the cleaning/decontamination of boots, gloves and fire-kit. If items cannot be sufficiently cleaned at the incident additional/ specialist cleaning should be established in accordance with Service Decontamination procedures.

Technical references	
1	Home Office Guide to Operational Risk Assessment
2	Confined Space Regulations 1997
3	HSE Operational Circular 334/5 Confined Spaces and the Fire Service
4	GRA 2.1 Confined Spaces
5	Home Office Technical Bulletin 1/97 Breathing Apparatus
6	Fire and Rescue Service Manual Volume 2, Fire Service Operations, Safe Work at Height, 2006
7	Fire Service Manual Incident Command
8	DCO/L 1/1998 Safe work in confined spaces
9	DCO/L 1/1997 Practical Precautions at Excavations (Trench/Pit Rescues)
10	FRDG 6/97 Fire Brigade Response Options Study Final Report
11	The Fire Cover Review – Report of the Task Group to the Central Fire Brigades
12	Advisory Councils – October 2002 – Technical paper C Response & Resource Requirements
13	2/2005 Physiological assessment of firefighting, search and rescue in the built environment
14	1/2005 Operational physiological capabilities of firefighters: literature review and research recommendations

SECTION 2

Summary of GRA 2.1.3

trenches/pits

Ref. No.	Activity	Hazard	Risk	Persons at risk	Control measures
1	Gaining access to site	• Unstable ground conditions	• Further collapse with vehicles and persons falling in crush, death serious injury, loss of equipment	• FRS personnel • Public • Police • Medical professionals • Non-service personnel	• Pre-planning including site inspections to identify suitable RV points, marshalling areas and appropriate PDA • Establish RV point away from the site • Establish marshalling area on hard standing • IC to establish stable ground from site occupants/specialist • Establish outer cordon a safe distance from scene of operations.
2	Gaining access/ egress to trench	• Working at height, slippery surfaces	• Slips, trips and falls on level and from height, collisions, unable to get out – serious injuries/death	• FRS personnel • Medical professionals • Non-service personnel • Casualty	• Maintain controlled access/egress and supervision at all times • Access only where sufficiently stabilised and supported • Ensure crews briefed • Consider aerial appliance for access and egress. • Establish evacuation plan and ensure all personnel are aware • Secure personnel with lines/harnesses • Illuminate as required • Appropriate PPE and equipment.

trenches/pits *(continued)*

Ref. No.	Activity	Hazard	Risk	Persons at risk	Control measures
3		• Exposure to elements	• Hypothermia heatstroke, sunburn etc • Wind effects on person's equipment • Tools and equipment slipping	• FRS personnel • Police • Medical professionals • Non-service personnel • Casualty	• Consider sheltering trench/pit provide lighting. • Rotate crew • Appropriate PPE allowing for ambient conditions • Provide welfare facilities.
4		• Protracted working in difficult conditions	• Fatigue/stress	• FRS personnel • Medical professionals • Non-service personnel • Casualty	• Crew selection • Appropriately trained and supervised teams of firefighters • Identify relief crews early into incident • Appoint safety officer. Supervise and monitor • Correct selection of PPE allowing for ambient conditions • Provide welfare facilities.
5		• Fatalities, stressful occurrences,	• Post traumatic stress • Anxiety	• FRS personnel • Medical professionals • Non-service personnel • Casualty	• Critical incident debrief • Welfare, support and counselling. • Health surveillance.

trenches/pits *(continued)*

Ref. No.	Activity	Hazard	Risk	Persons at risk	Control measures
6		• Poor illumination	• Slip trip and falls, collisions, injury and death	• FRS personnel • Medical professionals • Non-service personnel • Casualty	• Supplement with appropriate portable lighting or hand held lamps. • Atmospheric monitoring throughout to identify the need for intrinsically safe lighting • Consider the need for intrinsically safe lighting early into incident • Request additional resources.
7		• manual handling/manual labour	• musculoskeletal injury	• FRS personnel • Medical professionals • Non-service personnel • Casualty	• Use mechanical Aids where possible. (Hoists, harnesses, stretchers) • Crew selection • Supervision • Crew rotation • Use approved manual handling techniques • Use of on site specialists operating equipment e.g. Excavators where competent to do so.
8		• Unstable/inappropriate • Shoring	• Collapse leading to crush buried, death	• FRS personnel • Medical professionals • Non-service personnel • Casualty	• Identification (ensure covered in training) • Use on site specialists. • Use on site equipment to make good. • Do not commit personnel. • Consider the use of specialist team to make good.

trenches/pits *(continued)*

Ref. No.	Activity	Hazard	Risk	Persons at risk	Control measures
9		• Unstable ground • Conditions	• Further collapse with vehicles, equipment and persons falling in to trench or pit. Crush injuries, death	• FRS personnel • Public • Police • Medical professionals • Non-service personnel	• Pre planning including site inspections to identify suitable RV points, marshalling areas and appropriate PDA • Establish RV point away from the site • Establish marshalling area on hard standing • IC to establish stable ground from site occupants/specialist • Establish outer cordon a safe distance from scene of operations.
10	• Working in trench or pit	• Unstable ground	• Collapse of trench/ pit trapping/ burying personnel causing death/ major injury	• Fire and Rescue Service • Medical Professionals • Non-service personnel • Casualty	• Comply with HSE ACOP and Guidance for confined spaces • Identify inner cordon and control access and egress • Establish command and control system in line with national guidance to provide appropriate control and supervision throughout • Communicate evacuation plan to all • Seek specialist advice • Do not place plant or machinery near to trench/pit. Restrict/Control heavy plant or machinery, demolition and piling within vicinity.

trenches/pits *(continued)*

Ref. No.	Activity	Hazard	Risk	Persons at risk	Control measures
			• Collapse of surrounding structures, undermining walls, crushing/burying personnel leading to death and serious injury	• FRS personnel • Medical Professionals • Non-service personnel • Casualty	• Before any work commences consider sheets of wood (8x4 plywood) or similarrequire to be laid round the trench/ excavation this will dissipate the weight of FF round the trench and prevent further collapse • Ensure access to excavation point safe or protected by supporting system • Stabilise (shore, batter back etc) • Consider line access equipment • Commit minimum personnel appropriately trained and supervised to achieve task in suitable PPE • Appoint and brief safety officer, monitor for signs of collapse • Liaise with onsite contractors • Cordon off • Take advice from structural engineer on likelihood of collapse and possible supporting requirements. Consider shoring.

trenches/pits *(continued)*

Ref. No.	Activity	Hazard	Risk	Persons at risk	Control measures
11		• Working at height	• Falls into opening – physical injury, death	• Fire and Rescue Service • Public • Police • Medical professionals • Non-service personnel	• Establish and identify cordons • Strictly monitor personnel entering cordon • Clearly identify trench entry point • Brief crews • Remove debris, if safe to do so • Ensure area is adequately lit with appropriate lighting • Commit minimum personnel near edge of trench (avoid if possible) • Provision and use of suitable working at height equipment.
12		• Restricted work area	• Musculoskeletal injuries, collisions	• FRS personnel • Medical professionals • Non-service personnel	• Remove debris/obstructions if safe to do so • Consider using specialists • Control and monitor access • Rotate crews • Make use of mechanical aids • Appropriately trained and supervised teams of firefighters.

trenches/pits *(continued)*

Ref. No.	Activity	Hazard	Risk	Persons at risk	Control measures
13		• Utilities	• Strike resulting in explosive electrical discharge, electrocution • Release of gas (fire, explosion) burns, death • Water – drowning infection further collapse	• FRS personnel • Medical professionals • Non-service personnel	• Cordon off and control access to area • Appoint safety officer • Keep clear exit route • Ensure personnel briefed • Liaise with on site specialists and utility companies. • Consult risk intelligence • Employ detection equipment • Plant and machinery should be isolated and locked off where possible • Isolate utilities • Appropriate PPE • Excavate with hand tools only where utilities suspected • Ensure correct level of supervision.
14		• Hazardous materials (Bio hazards, sewage, effluent)	• Infection by pathogen, poisoning	• FRS personnel • Medical professionals • Non-service personnel • Casualty	• Carry out atmospheric monitoring • Ventilate • Use pump to reduce water/effluent levels. • Appropriate PPE/RPE • Use BA • Decontamination and hygiene procedures in place • Resuscitation equipment for casualty • Establish strict hygiene arrangements i.e. eating, drinking etc.

trenches/pits *(continued)*

Ref. No.	Activity	Hazard	Risk	Persons at risk	Control measures
15		• Ingress of water	• Drowning, slips trips falls, undermining of trench/pit	• FRS personnel • Medical professionals • Non-service personnel • Casualty	• Establish depth of water prior to entry • Ensure services isolated • Appoint safety officer, maintain contact at all times, and monitor water levels • Use appropriate pump to reduce water levels • Use appropriate water safety PPE • Appropriately trained and supervised teams of firefighters • Medical assistance • Obtain weather forecast (e.g. CHEMET and Firemet) regarding predicted rainfall.
16		• Oxygen deficient/irrespirable, noxious, • Toxic, flammable atmospheres	• Asphyxiation • Fire, explosion, burns, death	• FRS personnel • Medical professionals • Non-service personnel • Casualty	• Cordon off, and control area. • Carry out atmospheric monitoring. • Isolate Services • Ventilation • Establish and maintain intrinsic safety • Appoint safety officer. Regular atmospheric monitoring • Position pumps and generators away from trench. (Combustion engines) • Use Breathing Apparatus

trenches/pits *(continued)*

Ref. No.	Activity	Hazard	Risk	Persons at risk	Control measures
					• Resuscitator/ventilator. Inside and outside trench/pit • Supervision • Fire fighting media.
17		• Unstable/inappropriate shoring	• Collapse leading to crush buried, death	• FRS personnel • Medical professionals • Non-service personnel • Casualty	• Identification (ensure covered in training) • Use on site specialists • Use on site equipment to make good • Do not commit personnel • Consider the use of specialist team to make good.